A Tale of Two Science Buses: Diversity of Knowledge and Inclusion Practices

Other

Doing-It-Together Science Bus. Credit: Waag

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Executive Summary

Public engagement activities labelled in the same way can generate very different practices and experiences for participants. The key difference appears to be the way scientific knowledge is framed and the engagement activity is designed. This affects the scope and parameters of public experimentation and inclusion of social groups. It is important to use appropriate materialisations of 'science' to achieve intended public engagement goals.

Science Bus Context

Science buses are a common public engagement approach used by public museums and science institutions across the world. Their physical mobility is used to bring scientific experiments and knowledge closer to the public. This form of public engagement has a long history. For example, in India the first mobile science exhibition launched in 1965 [1] and involved buses traveling to rural areas to reach illiterate populations, and a 1983 UNESCO report provides a design manual and organisation advice for science buses [2]. Today, in Europe and the US, science buses tend to target children and involve them in hands-on small-scale experiments that are tied directly into the school curriculum. Typical experiments include *"how a potato clock works, what causes optical illusions, how to test for acids using red cabbage juice"* [3] . The concept being, that these experiments will illustrate well-established scientific concepts for the students. This tends to mean that the experiments are carefully designed and standardised for pre-defined age groups and with a specific scientific topic focus.

Comparing the two DITOs buses

This research insight focuses on the two science buses from Doing it Together Science (DITOs) project which is a H2020 funded Coordination and Support Action that is building citizen science and science communication across Europe. This report is an ethnographic vignette that compares the two science buses from the DITOs to highlight some differences that have broader pertinence. The XperiLAB truck was created by the Royal Belgian Institute of Natural Sciences (RBINS), while the official Do-It-Together science bus was coordinated by the Waag, an organisation focused on emerging technologies as instruments of social change. Both of the science buses were specially outfitted and staffed and carried specialised equipment for participatory workshops.

XperiLAB

XperiLAB Truck. Credit: RBINS

The XperiLAB truck created by RBINS has been operating since 2010 and travels across Belgium from school to school bringing structured science experiments to enhance the existing education programmes. The stated goal is that the activities should teach the inductive method to the children. The XperiLAB activities take place inside the truck via custom designed workstation consoles that each focus on single scientific concepts from biology, chemistry and physics such as hydrodynamics. During the workshops, energetic music plays as the pupils enter the science bus, change into lab coats and move towards the consoles that are illuminated with lighting, providing a dramatic atmosphere. Working in small groups, the school children simultaneously work on a series of hands-on

XperiLAB console. Credit: RBINS

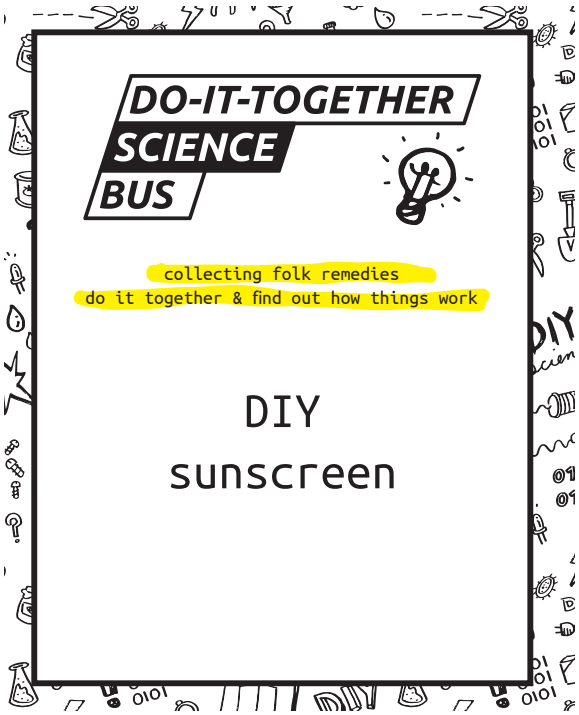
activities that involve physically manipulating and submerging objects and collecting data, guided by an on-screen computer persona that gives instructions. The activities, while closely based on scientific concepts, also use playful metaphors from popular media such as spy films, that are combined with game mechanics of team competition, button presses, time limits and point scores to reward progress through the activity. At the end of a workshop, the children are all gathered together for a collective discussion with the instructor who highlights the pedagogical value of the activities to the children.

Do-It-Together Science Bus

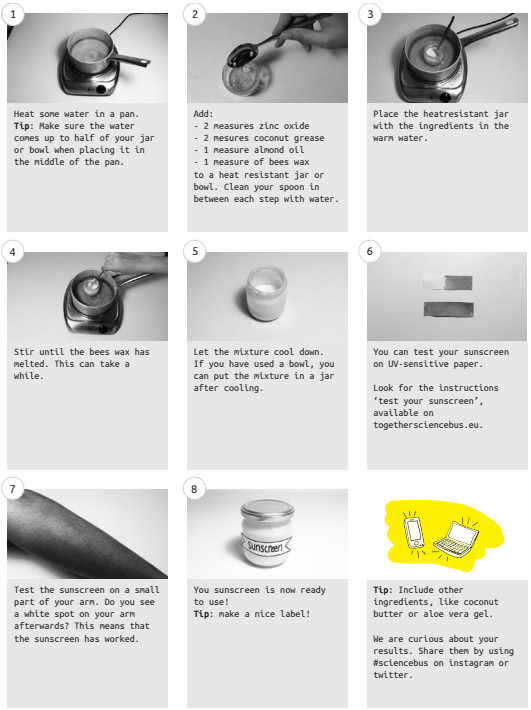
Do-It-Together Science Bus in Amsterdam. Credit: Waag

The scope and focus of the Do-It-Together science bus coordinated by the Waag was different. It started by recruiting multiple 'science bus captains' from the public to drive the bus across the whole of Europe and make 17 stops at a variety of community centres, small towns, public festivals and museums to run participatory workshops and document the process on social media. The goal was to involve a broad public in ready-made activities from the bus and ask the participants to contribute their own folk remedies and recipes that the bus would take on its journey to bring to new places and people. During the four workshops observed in Birmingham, the participants were a diverse age mix of children accompanied by parents and a significant number of elder members of the community. The ethnic and cultural breakdown was also highly diverse, including British people, as well as those from newly arrived and long-term ethnic communities. The main science bus activities were yoghurt-making and sun cream making, which involved participants sitting on long wooden benches in front of metal pots that they used to mix and heat ingredients such as milk or beeswax. The diverse mix of ages and 'homely' activity gave an atmosphere of a cooking lesson, with adults chatting and getting to know neighbours while kids were playing rock-paper-scissors. The science bus captains used the sun cream making activity as an opportunity to explain the physical properties of sun-rays and the yoghurt to teach about bacteria. Yet based on my discussions with participants, some had come to the activity because they usually took part in the community centre's activities while others had come for pragmatic reasons. One mother needed sun cream that would not irritate her child who was allergic to commercial sunscreen. Similarly, with the yoghurt, the participants wanted to take it home to eat. Thus, many of the participants used extra jars to mix additional batches of sun cream and yoghurt to give to friends. This seemed to surprise the science bus captains, who perceived the activities as demonstrating scientific principles that were more pure and educational than playing such a pragmatic part in people's everyday lives. At the end of the workshop, the local coordinator of the community centre where the event was hosted, thanked the science bus captains and told the group how pleased she was that the event showed that "*also normal people go to university - and you don't look like nerds*". Interviewing the community centre coordinator afterwards, she explained that the local area was a highly deprived area, and this meant local people didn't aspire to science because it was seen as remote and the people who carry it out, as 'other'. She saw the benefits of the science bus workshops as creating intergenerational bonds and connecting different community groups as well as offering an alternative to the 'guns and crime narrative', usually attributed to the area.

Yoghurt making workshop. Credit: Waag



DIY Sunscreen Instuctable [4]



Detail of the DIY Sunscreen Instuctable

Analysis

As the ethnographic vignettes of the two buses illustrate, both buses involved different practices and framings of scientific knowledge and publics. The XperiLAB bus targeted a specific age range of school children with activities and took place during lesson time and in the physical vicinity of the school and included the classes teacher. The XperiLAB framing is that the bus is an extension of the school classroom. In particular scientific knowledge is defined by the workshop activity and the experiment constrained to the consoles that the children stand around within the bus. In contrast, the Waag science bus had a looser concept of scientific knowledge and publics that revolved around the notion of 'instructables'. These are text and image guides that are created by people within online forums to share instruction for a variety of projects. Crucially instructables are peer-created and shared amongst 'makers' without any clear assertion of knowledge authority or expertise. The workshop activities were available as printed instructables as well as website downloads, which meant the participants could carry out the experiment one their own at home. The bus workshops where thus a physical run-through of the instructable information as guided by the science bus captains. Furthermore, the Waag bus was collecting folk remedies from the workshop participants as a two-way knowledge exchange process. By framing folk remedies as 'life hacks', they positioned them similar to the instructables already created for the bus. For the Waag bus, the scientific experiment was the bus trip itself that extended across the whole of Europe gathering recipes. A key part of the Waag bus, were the video blogs and social media content produced by the science bus captains on their European journey documenting their experiences. For the Waag team, this social media presence was a key outcome of the project and the main way in which it was documented. Thus, the scientific experiment extended across the whole of Europe, and via the instructables entered into people's homes.

The different concepts of knowledge of the two hosting organisations had an effect on the design of the two buses and their experiments. Furthermore, this had an impact in the reach and make-up of the potential audiences and publics they could involve. The notion of the instructable presents an expansive concept that allowed practically useful activities such as sun cream and yoghurt making as well as the inclusion of different kinds of knowledge via the concept of folk remedies. This had a direct impact on the possibility of reaching the age and ethnically diverse audience. Both the pragmatic and homely nature of the activities allowed the intergenerational as well as cultural mixing. Interviews with the Waag bus organisers and science bus captains suggest they were not specifically targeting cultural or social inclusion. The majority of the Waag bus stops did not explicitly target deprived areas but visited a wide range of different settings including rural areas such as the small town of Aranda de Duero in Spain as well as large public festivals and science museums. Rather, it was the expansive notion of scientific knowledge in the form of the instructable that allowed the workshops to function in many different settings and with different audiences. In the last years, it was possible to see the emergence a new model of scientific outreach derived from internet communities, 'maker cultures' and DIY science that is premised on qualities of openness, pragmatism and two-way exchange. An example of one these maker science buses is 'Junk Genies' run by Cornell University, which focuses on student initiated ideas, 'self efficacy' and 'just-in-time teaching' [5].

Afterthought

During the process of the DITOs project, there was a shift in the way RBINS were engaging with the XperiLAB bus. Previously the bus would visit any Belgian school that would invite them to come and pay the fee. Yet during the process of the DITOs project, the location of the Xperilab workshops were geographically mapped and analysed for the first time. Having this overview and discussions around inclusion have led to discussions in the RBINS team about whether deprived areas should be specifically targeted by the bus in the future. If this approach was adopted it would be part of a shift towards framing inclusion a part of science education and led to an expansion of scope of the bus experiment. These discussions can be attributed to the XperiLAB participation in the DITOs project.

Conclusions

This ethnographic vignette suggests that the way scientific knowledge is framed defines the scope of public engagement activities and impacts the inclusion of social groups.

There is potential for cross-fertilisation between 'classic' models of science outreach and fresh approaches from DIY science and maker cultures.

How to Cite

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Colophon

This policy brief was written by Christian Nold on behalf of UCL as part of the DITOs project evaluation. While this was carried out as part of H2020 'Doing It Together Science' (DITOs) Coordination and Support Action project, the views expressed in it do not reflect the consensus opinion of DITOs partners.

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